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(54) PUMP ASSEMBLY

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PUMP ASSEMBLY

ABSTRACT OF THE DISCLOSURE

A rod-drawn pump for use in a well includes a housing and a rod reciprocating within the housing to move a plunger in a series of alternating upward strokes and downward strokes. The plunger defines a pump chamber with a standing valve through which liquid from the well passes during the upward stroke of the plunger. During the downward stroke, the liquid in the pump chamber passes through a traveling valve in the plunger and into a particular cavity defined by the plunger and a third valve. During the next upward stroke, the liquid in the particular cavity passes through the third valve to produce a column of the liquid which is eventually lifted from the well. The third valve supports the column of the liquid during the next downward stroke so that the traveling valve in the plunger is open when it contacts the surface of the liquid in the pump chamber. This inhibits gas and liquid pound during the downward stroke. Portions of the rod at least partially define a passage which bypasses the third valve near the end of the downward stroke to substantially fill the particular cavity prior to the upward stroke. This inhibits any gas or liquid pound which might otherwise result during the upward stroke.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

- 1 1. A pump adapted to move a fluid from a first
2 elevation to a second, higher elevation, including:
3 a hollow tubing disposed in a particular direction
4 having a major vertical component;
5 control means including a rod disposed within the
6 tubing and in the particular direction and having properties
7 for being reciprocated in the particular direction relative to
8 the tubing to produce alternating upward and downward strokes;
9 the control means including plunger means having a
10 fixed relationship with the rod and being reciprocated by
11 the rod within the tubing relative to the tubing in the
12 particular direction;
13 first valve means included in the control means and
14 having characteristics for providing for a flow of the fluid
15 upwardly from a region below the plunger means to a region
16 above the plunger means during substantially all of the down-
17 ward stroke of the plunger means relative to the tubing and for
18 inhibiting the flow of the fluid downwardly from the region
19 above the plunger means to the region below the plunger means
20 during substantially all of the upward stroke of the plunger
21 means relative to the tubing;
22 second valve means disposed within the tubing above
23 the first valve means and defining with the tubing and the
24 plunger means a first particular cavity which increases in size

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1 BACKGROUND OF THE INVENTION

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3 Field of the Invention

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5 This invention relates generally to pumps and
6 more specifically to rod-drawn subterranean pumps for
7 use in wells such as oil and water wells.

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9 Description of the Prior Art

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11 Subterranean pumping apparatus of the prior art
12 have typically included a cylindrical housing suitable for
13 operational disposition at the bottom of a well, such as
14 an oil well or a water well. In a common type of pumping
15 apparatus, a rod string extends into the pump housing to
16 support a plunger within the housing. The rod string is
17 reciprocated to move the plunger in alternating upward and
18 downward strokes.

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20 A stationary valve, which is typically located
21 at the bottom of the pump, defines with the housing and
22 the plunger, a pump cavity. The stationary valve permits
23 the fluid in the well to enter the pump chamber on the
24 upward stroke of the plunger and inhibits the flow of the
25 fluid from the chamber during the downward stroke of the
26 plunger.

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28 During the upward stroke of the plunger, the
29 standing valve opens to permit gas and liquid from the well.

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